UNIVERSITY OF PLYMOUTH
School of Engineering, Computing & Mathematics

Lecture 1: Introduction, HTML, CSS & JavaScript

Full-Stack Development

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Introduction

Today's topics

1. Module introduction
2. HTML
3. CSS
4. JavaScript – brief introduction, more in subsequent sessions

Session learning outcomes – **by the end of today's lecture you will be able to:**

- Use HTML elements to construct a webpage
- Apply CSS rules to achieve the desired styling of a webpage
- Use JavaScript to implement some basic behaviour

Introduction

Aims: To develop an understanding of the role of **advanced scripting techniques** within the development of **dynamic web applications**, and issues in **representing**, **communicating** and **interacting** with **distributed**, **live** and **multi-user** content

Learning outcomes

At the end of the module the learner will be expected to be able to:

1. Apply principles of **object-oriented** and **event-based** scripting as well as **synchronous** and **asynchronous** client-server
2. Demonstrate an understanding of how application content is **represented and communicated** across the web and how this affects the **user experience**
3. **Design**, **implement** and **evaluate/test** dynamic web-based applications

Introduction

Schedule (subject to change)

Session One – Introduction, HTML, CSS, JS

Session Two – JavaScript

Session Three – JavaScript OOP

Session Four – Node.js, Ajax, & Express

Session Five – Client-side Frameworks

Session Six – Testing

Session Seven – Server-side Persistence

Session Eight – Client-side Persistence

Session Nine – Beyond client-server & DevOps

What is the Web?

The Internet

- A publicly accessible worldwide system of interconnected computer networks

The World Wide Web

- A service on the Internet based on four technologies
  - A set of **hypertext pages**
  - Content defined using the HTML mark-up language
  - Client access through servers using HTTP
  - Connected over the Internet using **URIs**

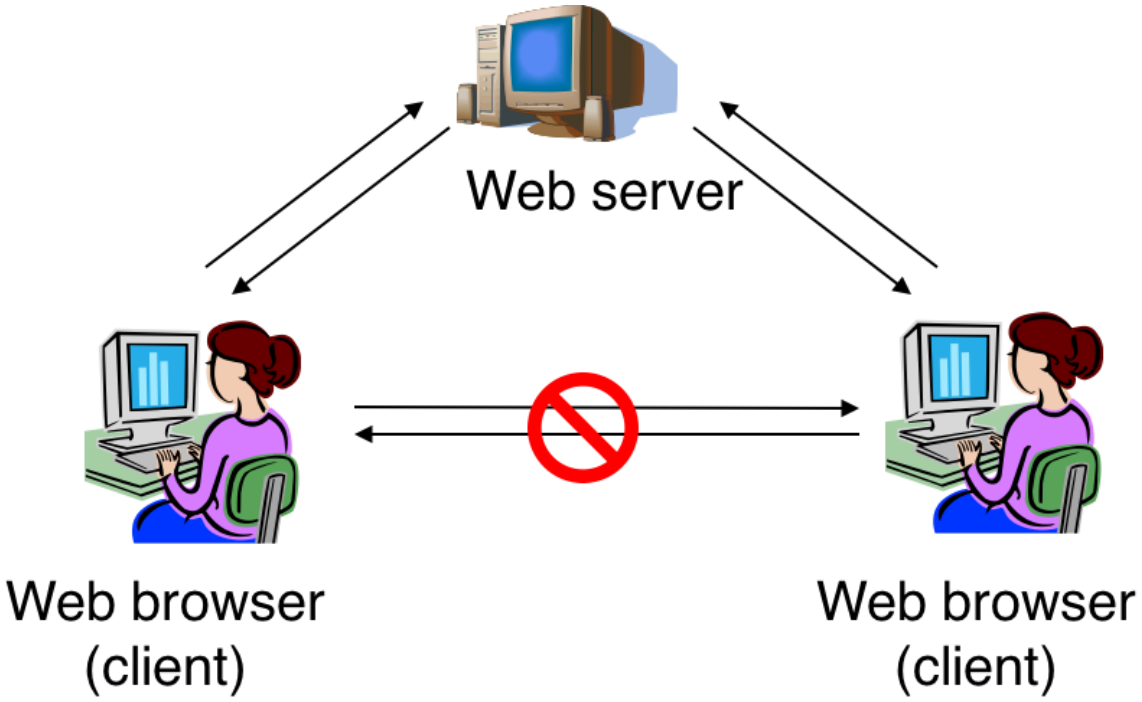
Web browsers and web servers

Client (browser)

- Requests pages
- Receives Response back (data)
- Displays HTML

Server

- Accepts requests
- Finds and processes files
- Replies by returning data



Content – separation of responsibility

- Structure – **HTML**
- Style – **CSS**
- Behaviour – **JavaScript**
- Scalable
- Maintainable

HTML: Hyper-Text Markup Language

- Text interspersed with **tags** indicating text properties

```
<element attr1="val" attr2="val">
    Element content goes here…
</element>
```

- e.g., `<b>This will be bold</b>`
- Elements can be **self-closing**, e.g., `<img src="mypic.jpg" />`

HTML: Elements

- element = start tag + content + end tag
  - bold: **This will be in bold**
  - italic: *This will be in italic*

- work like brackets
  - start/open
  - end/close

HTML: Page Structure

- every HTML page has 2 sections:

head
(info)

body
(content)

```
<html>
  <head>
    <title>Test</title>
  </head>
  <body>
    <p>This is a test <b>page</b>.</p>
  </body>
</html>
```

HTML: Attributes

- Some tags need extra information to work:
  - Anchor (hyper-link) element:

```
<a href="nextpage.htm">Next Page</a>
```

attribute (page to jump to)

  - Image element:

```
<img src="Beach.jpg" />
```

attribute (filename of picture to display)

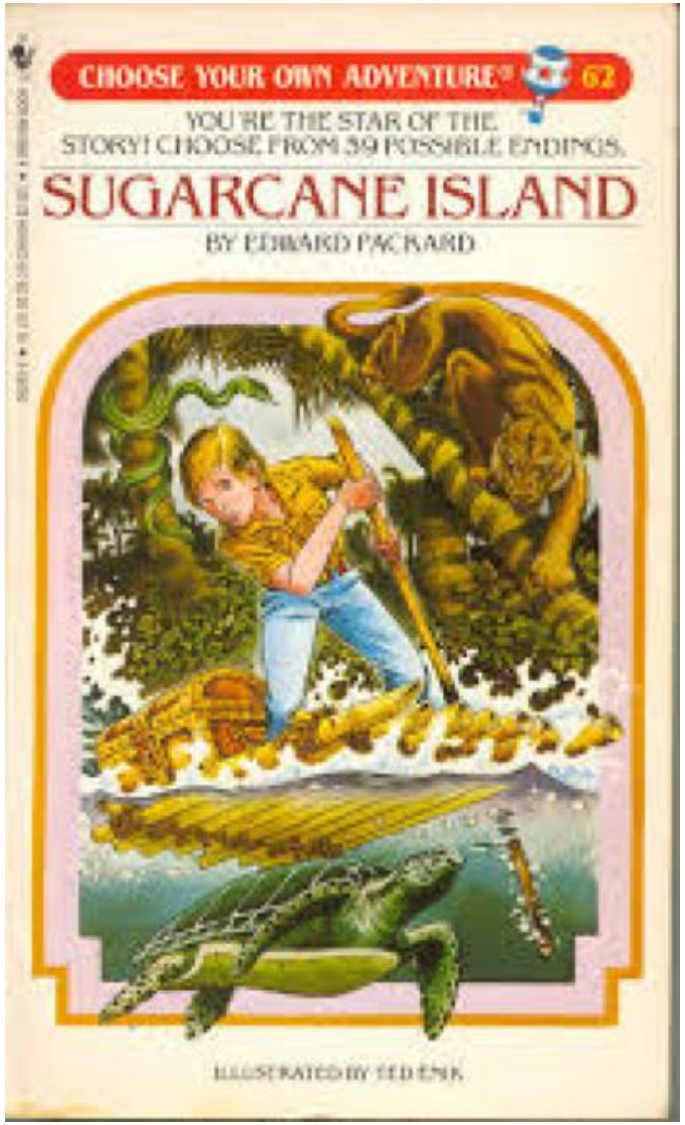
HTML: Anchors (Hypertext)

Text linked to other text

- **The Garden of Forking Paths**, Jorge Luis Borges (1941)

Specific tag to "anchor" text to another document

```
<a href="http://xxx.yyy">text</a>
```



CSS: Style – Cascading Style Sheets

Style

- Layout, colours, font, visibility

CSS

- A language for defining the style of HTML elements
- Rules of a set formal
- Independent of structure, ideally in a separate file

Same structure with different styles

- **Zengarden (http://www.csszengarden.com/)**

CSS: Anatomy

selector { declaration }

- The **selector** is the element within a page to which the style should be applied
- The **declaration block** follows the selector and is delimited by braces { }
- A **declaration** compromises a **property** and a **value** and is terminated with a semicolon – a declaration block can contain multiple declarations

```
body {
    font-family: verdana, sans-serif;
    font-size: 12px;
}
```

CSS: Selectors

- Elements

```
body { }
p { }
h1 { }
```

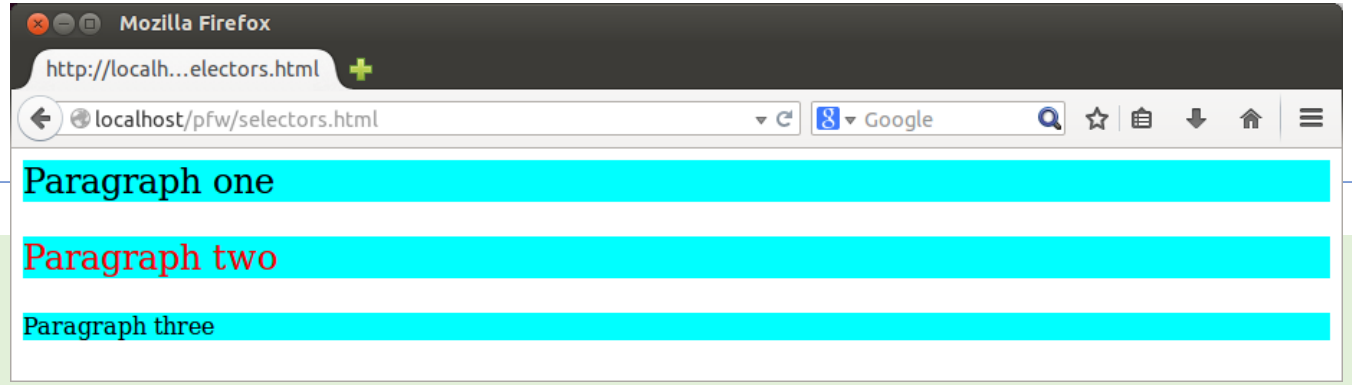
- Classes (can refer to multiple elements) `.class_name`

```
.header { }
.forumpost { }
```

- IDs (can refer to **only one** element) `#element_id`

```
#listitem1
#person47
#errormsg
```

CSS: Selectors




```
<html><head>
    <style>
        p { background-color: cyan; }
        .mypara { font-size: 24px; }
        #mostimportant { color: red; }
    </style>
</head>
<body>
    <p class="mypara"> Paragraph One</p>
    <p class="mypara" id="mostimportant">Paragraph Two</p>
    <p>Paragraph Three</p>
</body></html>
```

CSS: Selectors

- Attribute

  `selector[attribute]`

  `selector[attribute="value"]`

```
p[id] {}
p[dir="rtl"] {}
```

- Pseudo-class

  `selector:pseudo-class`

```
a:hover {}
a:visited {}
```

- Pseudo-element

  `selector::pseudo-element`

```
p::first-child {}
a::after {}
```

CSS: Rule specificity

Rule specificity is used to resolve rule clashes – it is based on the composition of the selector

Defining the specificity of a rule

- Add 0, **1**, 0, 0 for each ID selector
- Add 0, 0, **1**, 0 for each class, attribute or pseudo-class
- Add 0, 0, 0, **1** for each element of pseudo-element

So:

- `p` has specificity 0, 0, 0, **1**
- `p.article` has specificity 0, 0, **1**, **1**

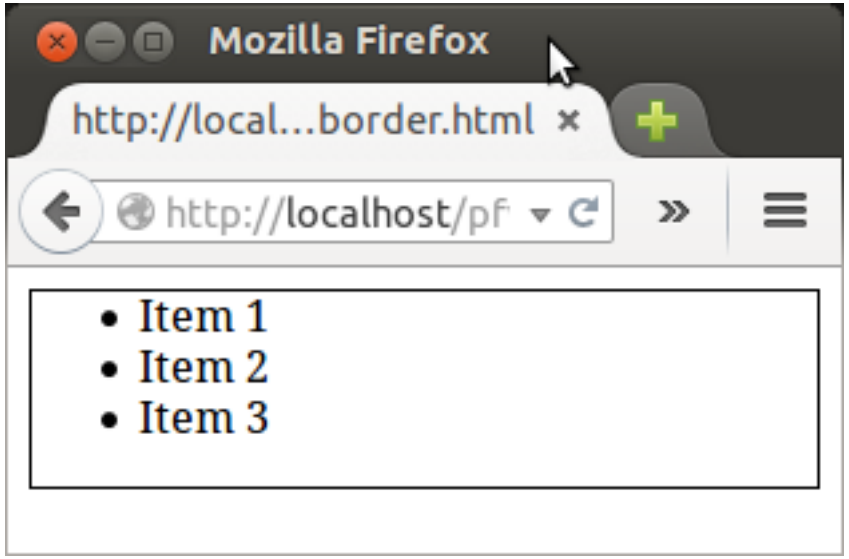
Define the specificity:

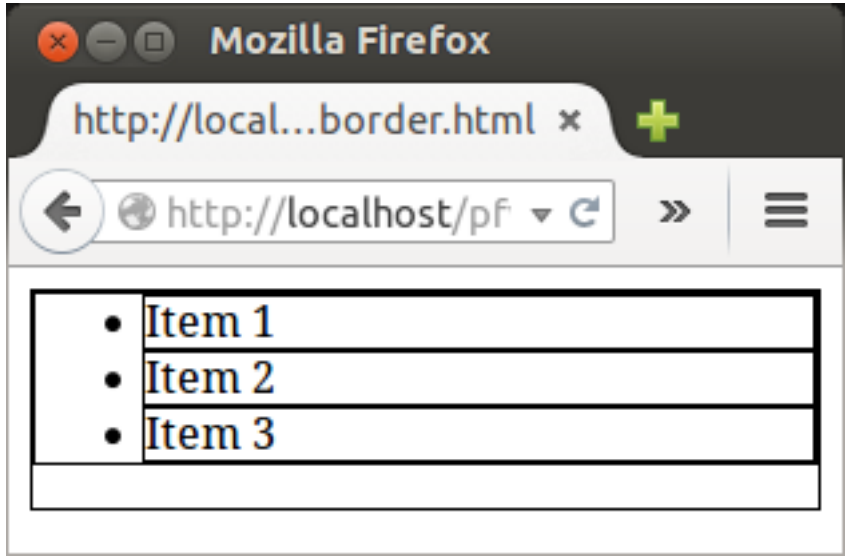
- ol ul#firstmenuitem
- .main .article a:visited
- body #content .post img:hover

CSS: Inheritance

- Elements **inherit** the properties of their ancestors
- Greatly reduces the amount of style information that must be specified
- Not all properties are inherited (e.g., borders)

```
border { border: 1px solid #000; }
```



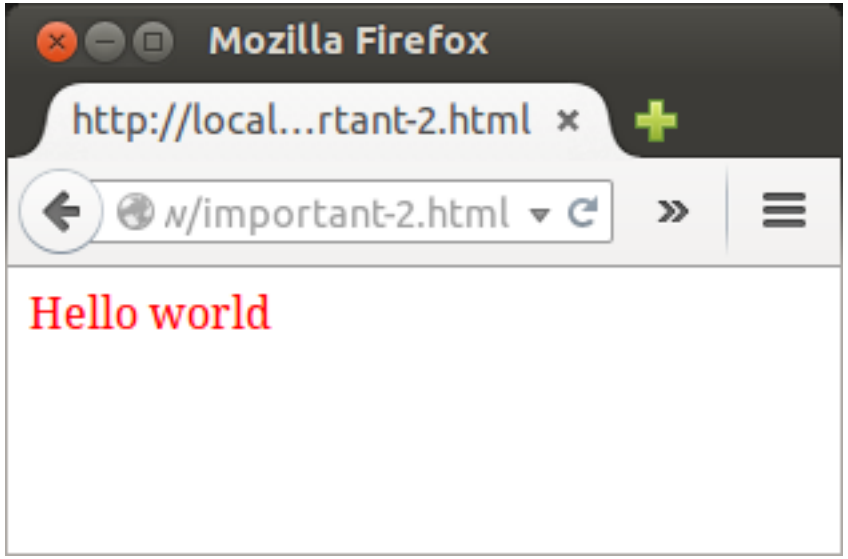


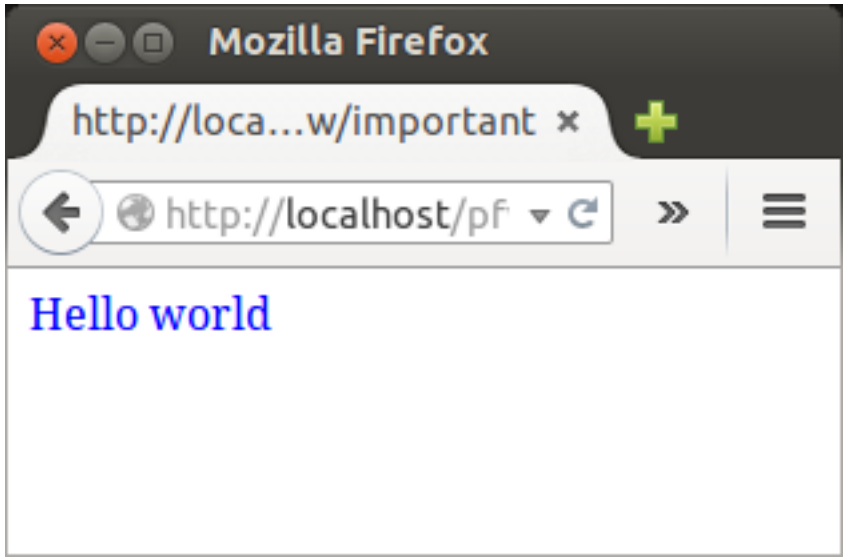
CSS: The Cascade

1. Sort according to explicit weight and origin
   - !important
   - Author, reader, user, agent
2. Specificity
3. Declaration order
   - Later declarations given more weight than early declarations
   - Imported declarations come before those in the importing CSS

```
.mypara { color: blue; }
p { color: red; }
```

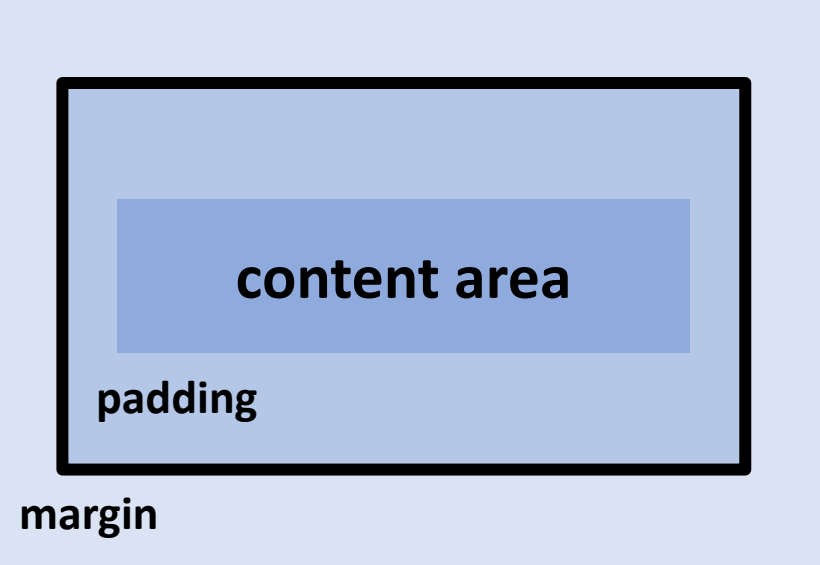
```
.mypara { color: blue; }
p { color: red; !important }
```





CSS: Page Layout – Element Boxes

Every element generates an element box (a rectangle) around it



- Margins receive the colour or background of the parent element
- Padding receives the colour or background of the foreground and **must be non-negative**

CSS: Block-Level Elements

e.g., `ps`, `divs` – a new line is generated before and after causing them to stack

- Use **`display: block`** to convert an inline element to a block-level element
- Width and height do not take into account margins, padding or borders

Element box width:

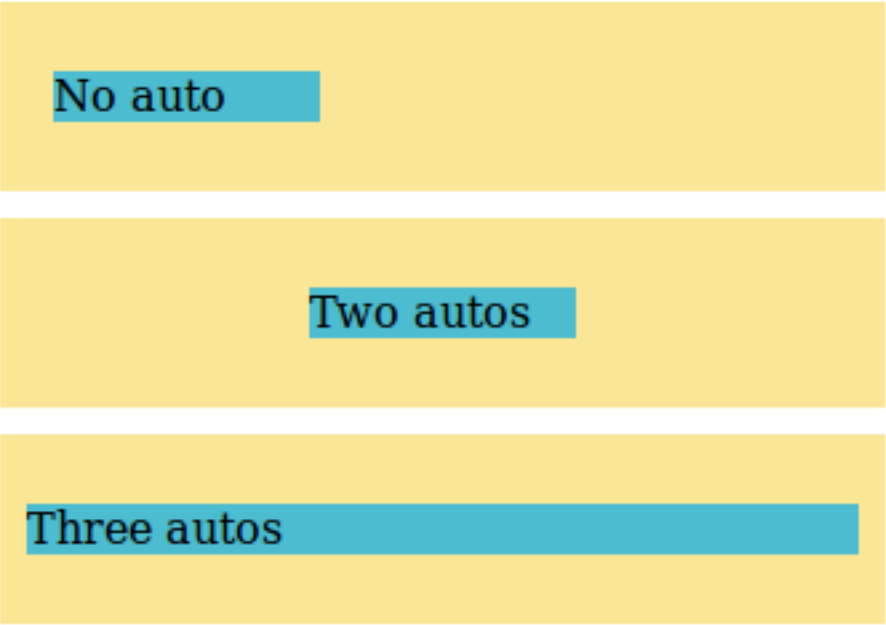
```
margin-left +
border-left +
padding-left +
width +
padding-right +
border-right +
margin-right
```

Seven properties of horizontal formatting

CSS: `auto`

`margin-left`, `width` and `margin-right` can all be set to `auto`

- The browser determines the amount of width to assign to each
  - No **`auto`**s: **`margin-right`** is set to **`auto`**
  - Two **`auto`**s: the two margins are of equal width
  - Three **`auto`**s: the margins are set to 0 and the **`width`** takes the entire space



CSS: Floating

- Removes an element from the normal flow of the document (content flows around it)
- Must specify a width – defaults to zero width

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CSS: Floating

- Float Placement Rules
- Must be within its containing elements
- Cannot be higher than the top of earlier floats – to prevent floats drifting up
- Floats cannot overwrite each other
- Browsers will place a float as high as possible – height is preferrable to a position further in the direction it floats

HTML

```
<div id="leftdiv"><p>Left</p></div>
<div id="rightdiv"><p>Right</p></div>
```

CSS

```
#leftdiv { background-color: red; width: 59%; float: left; }
#rightdiv { background-color: blue; width: 39%; float: right; }
```

CSS: Clearing

Clearing ensures that an element does not have floating elements around it

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Top Level Heading

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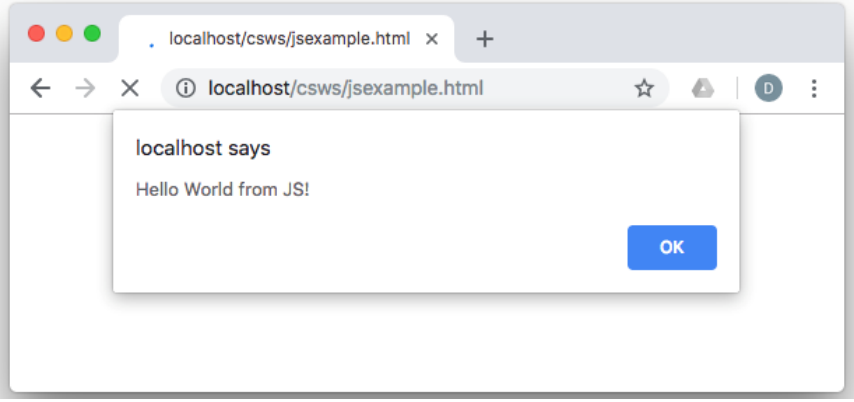
Top Level Heading

JS: Behaviour

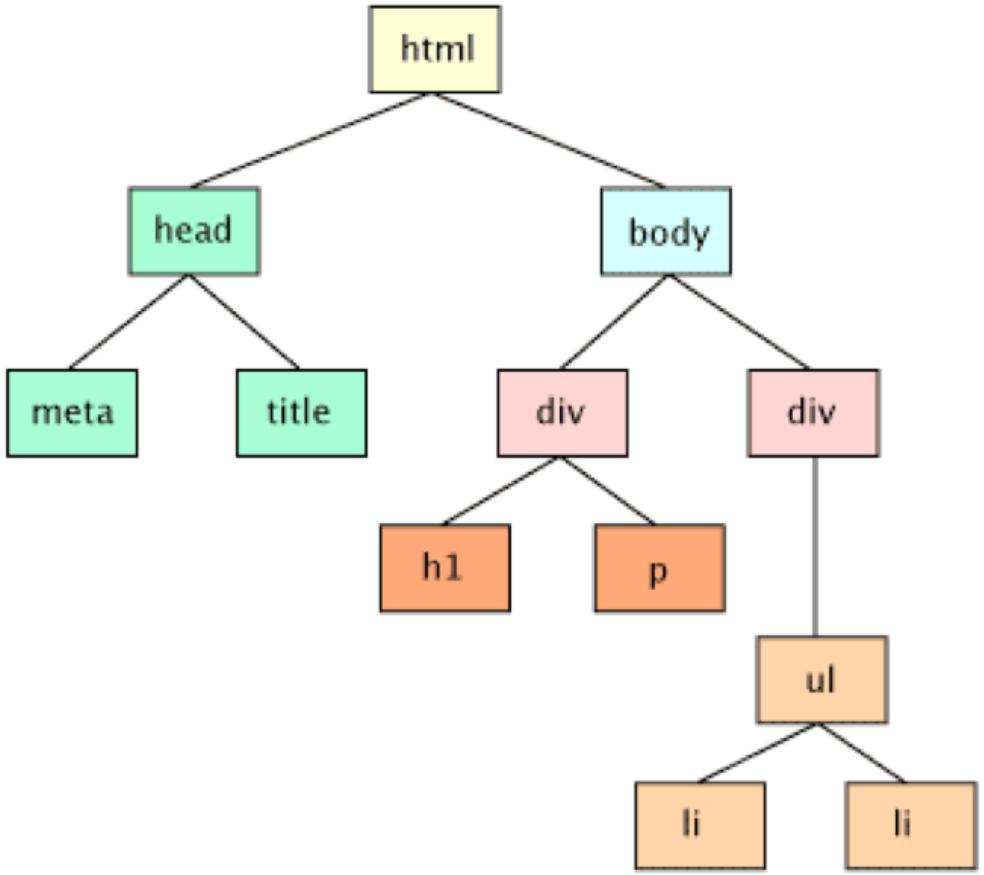
- JavaScript (JS) = programming language
- Until Ajax (IE5 1999) JS was considered a lightweight tool for web developers
- Since then an explosion of frameworks (**node.js**) and libraries (**jQuery**)
- Now dominant as a client-side scripting language

```
<html>
<head>
  <script>
    window.onload = function() {
      alert("Hello World from JS!");
    }
  </script>
</head>
<body></body>
</html>
```



JS: The Document Object Model

- A convention for presenting HTML elements as objects
- Nested HTML elements create a tree structure
- Can be accessed using JS – `document.getElementById()`



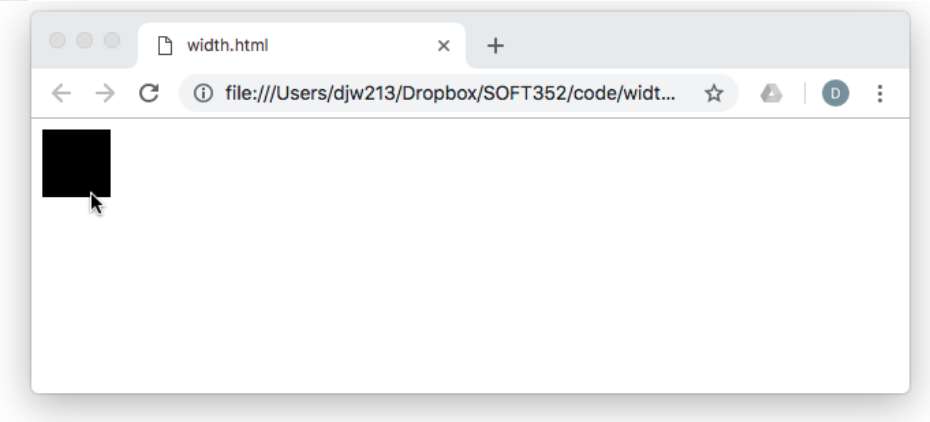
JS: Example

HTML (main.html)

```
<html>
  <head>
    <link rel="stylesheet" href="main.css">
    <style></style>
    <script></script>
  </head>
  <body>
    <div id="mydiv"></div>
  </body>
</html>
```

CSS (main.css)

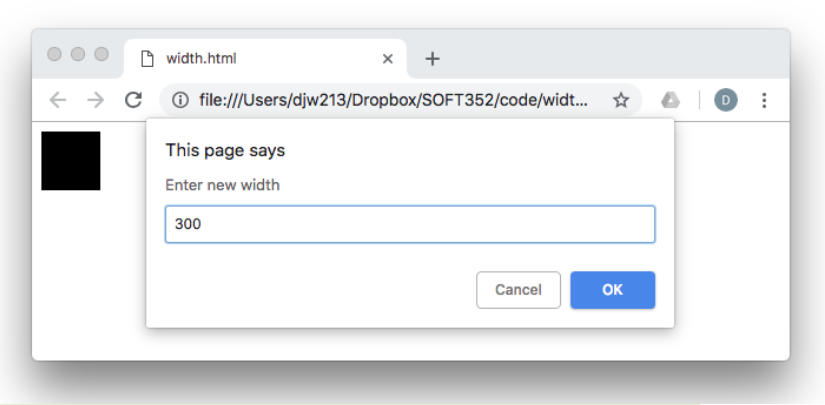
```
#mydiv {
  display: block;
  background-color: #000;
  width: 50px;
  min-height: 50px;
}
```

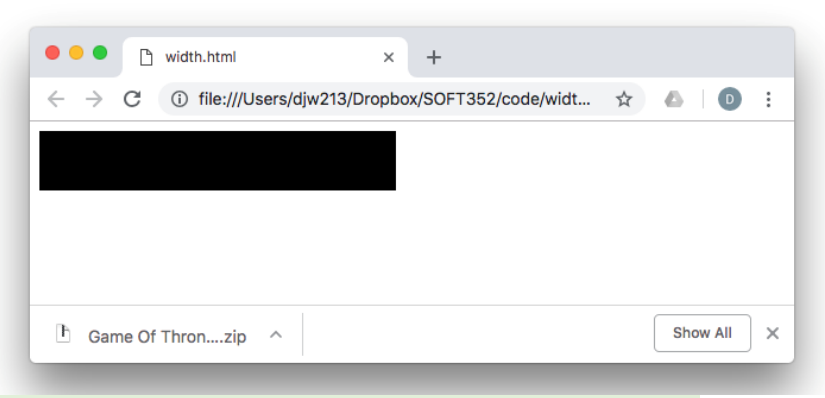


JS: Example

```
function changeWidth(newWidth) {
  let elem = document.getElementById("mydiv");
  elem.style.width = newWidth + "px";
}

window.onload = function() {
  let elem = document.getElementById("mydiv");
  elem.addEventListener("click", function() {
    let newWidth = prompt("Enter new width");
    changeWidth(newWidth);
  });
};
```





Summary

The World Wide Web

- Web usage is increasing
- Multiple platforms, browsers and CMSs

Client-server architecture

- Multiple clients (web browser) sends requests
- Web server returns requested resource

Content, style and functionality – separated responsibility

- HTML – **content**, CSS – **style** and JavaScript - **functionality**